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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
THANGAVELU, KANDASAMY	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/639,870	DEJACK ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-11,13-23 and 25-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *25,26,28- and 32* is/are allowed.

6)☒ Claim(s) *1,2,4-6 and 13-18* is/are rejected.

7)☒ Claim(s) *7-11,19-23,27 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is in response to the Applicant's Amendments, mailed on April 16, 2004. Claims 3, 12 and 24 were cancelled. Claims 1, 4-6 and 13 were amended. Claims 1, 2, 4-11, 13-23 and 25-32 are pending. This office action is made non-final.

Response to Arguments

2. Applicant's arguments filed on April 16, 2004 with respect to claim rejections under 35 U.S.C. 112 second paragraph have been fully considered. The claim rejections under 35 U.S.C. 112 second paragraph are withdrawn in response to the applicant's amendment dated March 12, 2004. Additional claim rejections under 35 U.S.C. 103 (a) are included in this office action.

Drawings

3. The drawings submitted on April 16, 2004 are accepted.

Claim Objections

4. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

5. Claims 27 and 31 are objected to because of the following informalities:

In amendment dated March 12, 2004, Claim 27, Para 3, "creating nodes for each transition portion of the bolt transitioning between the non-threaded portion of the threaded block and a threaded block thread" appears to be incorrect and it appears that it should be "creating nodes for each transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded block thread".

In amendment dated March 12, 2004, Claim 27, Para 4, "generating a mesh of the threaded block threads using helical coordinates" appears to be incorrect as the transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded block thread will not have any threads.

In amendment dated March 12, 2004, Claim 31, Para 4, "generating a mesh of the threaded block threads using helical coordinates" appears to be incorrect as the transition portion of the threaded block transitioning between the non-threaded portion of the threaded block and a threaded block thread will not have any threads.

Appropriate corrections are requested.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-6, and 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Sakaguchi et al.** (U.S. Patent 5,946,479) in view of **Miller et al.** (U.S. Patent 6,045,310) and further in view of **McCreery** (U.S. Patent 4,359,206) and **Zicheng et al.** ("A study of helical coordinate system and helical slow wave structure", IEEE 1998).

8.1 **Sakaguchi et al.** teaches Method and device for generating mesh for use in numerical analysis. Specifically, as per Claim 1, **Sakaguchi et al.** teaches a system of generating a finite element mesh for regions of an object and joining structure assembly (Abstract, L1-2; CL1, L24-29); comprising:

a computer system, wherein the computer system includes a memory, a processor, an input device and a display device (Fig. 3; Abstract, L1-2); and

a mesh model of an object and joining structure assembly generated on the computer system (CL1, L24-29; CL2, L24-29).

Sakaguchi et al. does not expressly teach system of generating a finite element mesh for a threaded fastener and joining structure assembly; and a mesh model of the threaded fastener and joining structure assembly generated on the computer system. **Miller et al.** teaches system of generating a finite element mesh for a threaded fastener and joining structure assembly; and a mesh model of the threaded fastener and joining structure assembly generated on the computer system (Fig.2A; CL6, L54-64; CL8, L48-56), as finite element models may be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances (CL8, L53-56). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** with the system of **Miller et al.** that included system of generating a finite element mesh for a threaded fastener and joining structure assembly; and a mesh model of the threaded fastener and joining structure assembly generated on the computer system, as finite element models might be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances.

Sakaguchi et al. teaches that the nodes and elements for each object and joining structure assembly are created using cylindrical coordinates (CL29, L10-18). **Sakaguchi et al.** does not expressly teach that the nodes and elements for each non-threaded portion of the threaded fastener and joining structure assembly are created using cylindrical coordinates. **Miller et al.** teaches that the nodes and elements for each non-threaded portion of the threaded

fastener and joining structure assembly are created (Fig.2A; CL6, L54-64; CL8, L48-56), as that would allow finite element models to be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances (CL8, L53-56). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** that included the nodes and elements for each object and joining structure assembly being created using cylindrical coordinates with the system of **Miller et al.** that included the nodes and elements for each non-threaded portion of the threaded fastener and joining structure assembly being created, as that would allow finite element models to be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances.

Sakaguchi et al. does not expressly teach that nodes and elements for each threaded portion of the threaded fastener and joining structure assembly are created using helical coordinates. **McCreery** teaches that the exterior surface of the threaded fastener and the interior surface of the nut contain helical thread (CL4, L47-54; CL8, L62-63), as that would allow the fastener to move relative to the nut through a distance as required for fastening (CL4, L51-54). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to include in the system of **Sakaguchi et al.** the system of **McCreery** that included the threaded fastener and the nut containing helical thread, as that would allow generating a finite element mesh for a threaded fastener and joining structure assembly containing helical thread.

Sakaguchi et al. does not expressly teach that nodes and elements for each threaded portion of the threaded fastener and joining structure assembly are created using helical coordinates. **Zicheng et al.** teaches helical coordinate system that can be applied to solve problems related to helical structures (Page 775, Para 1), as that would allow modeling the

coordinate curves that coincide with the helix (Page 775, Para 5). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** the system of **Zicheng et al.** that included helical coordinate system that could be applied to solve problems related to helical structures, as that would allow modeling the coordinate curves that coincide with the helix.

8.2 As per Claim 2, **Sakaguchi et al., Miller et al. , McCreery** and **Zicheng et al.** teach the system of Claim 1. **Sakaguchi et al.** also teaches that the mesh model of the object and joining structure assembly includes a mesh generated for an object joining block (CL1, L24-29; CL2, L24-29).

Sakaguchi et al. does not expressly teach that the mesh model of the threaded fastener and joining structure assembly includes a mesh generated for a fastener joining together a clearance hole block and a threaded block. **Miller et al.** teaches that the mesh model of the threaded fastener and joining structure assembly includes a mesh generated for a fastener joining together a clearance hole block and a threaded block (Fig.2A; CL6, L54-64; CL8, L48-56), as that would allow finite element models to be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances (CL8, L53-56). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** with the system of **Miller et al.** that included the mesh model of the threaded fastener and joining structure assembly including a mesh generated for a fastener joining together a clearance hole block and a threaded block, that would allow finite element

models to be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances.

8.3 As per Claim 4, **Sakaguchi et al., Miller et al. , McCreery** and **Zicheng et al.** teach the system of Claim 2. **Sakaguchi et al.** also teaches that the mesh of the fastener includes nodes created in radial, tangential and vertical directions for each non-threaded portion of the fastener using cylindrical coordinates and elements defined by interconnecting the nodes (CL1, L29-36; CL29, L10-18);

nodes created for each transition portion of the fastener transitioning between the non-threaded portion of the fastener and a threaded portion of the fastener by stretching a hexahedral element in a vertical direction while sweeping about a vertical axis, and elements defined by interconnecting the nodes and interleaving wedge elements at the end of a revolution (CL1, L29-36); and

nodes for each transition portion of the fastener transitioning between the fastener threads and a non-threaded portion of the fastener created by shrinking a hexahedral element in a vertical direction while sweeping about a vertical axis, and elements defined by interconnecting the nodes and interleaving wedge elements at the end of a revolution (CL1, L29-36).

Sakaguchi et al. does not expressly teach a mesh of the fastener thread generated using helical coordinates. **McCreery** teaches that the exterior surface of the threaded fastener and the interior surface of the nut contain helical thread (CL4, L47-54; CL8, L62-63), as that would allow the fastener to move relative to the nut through a distance as required for fastening (CL4, L51-54). It would have been obvious to one of ordinary skill in the art at the time of Applicant's

invention to include in the system of **Sakaguchi et al.** the system of **McCreery** that included the threaded fastener and the nut containing helical thread, as that would allow generating a finite element mesh for a threaded fastener and joining structure assembly containing helical thread.

Sakaguchi et al. does not expressly teach a mesh of the fastener thread generated using helical coordinates. **Zicheng et al.** teaches helical coordinate system that can be applied to solve problems related to helical structures (Page 775, Para 1), as that would allow modeling the coordinate curves that coincide with the helix (Page 775, Para 5). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** the system of **Zicheng et al.** that included helical coordinate system that could be applied to solve problems related to helical structures, as that would allow modeling the coordinate curves that coincide with the helix and a mesh of the fastener thread generated using helical coordinates.

8.4 As per Claim 5, **Sakaguchi et al., Miller et al.** , **McCreery** and **Zicheng et al.** teach the system of Claim 2. **Sakaguchi et al.** also teaches that the mesh of the threaded block includes nodes created in radial, tangential and vertical directions for each non-threaded portion of the threaded block using cylindrical coordinates and elements defined by interconnecting the nodes (CL1, L29-36; CL29, L10-18);

nodes created for each transition portion of the threaded block transitioning between the non- threaded portion of the threaded block and a threaded portion of the block by stretching a hexahedral element in a vertical direction while sweeping about a vertical axis, and elements

defined by interconnecting the nodes and interleaving wedge elements at the end of a revolution (CL1, L29-36); and

nodes for each transition portion of the threaded block transitioning between the threaded block threads and a non-threaded portion of the threaded block created by shrinking a hexahedral element in a vertical direction while sweeping about a vertical axis, and elements defined by interconnecting the nodes and interleaving wedge elements at the end of a revolution (CL1, L29-36).

Sakaguchi et al. does not expressly teach a mesh of the threaded block thread generated using helical coordinates. **McCreery** teaches that the exterior surface of the threaded fastener and the interior surface of the nut contain helical thread (CL4, L47-54; CL8, L62-63), as that would allow the fastener to move relative to the nut through a distance as required for fastening (CL4, L51-54). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to include in the system of **Sakaguchi et al.** the system of **McCreery** that included the threaded block and the nut containing helical thread, as that would allow generating a finite element mesh for a threaded block and joining structure assembly containing helical thread.

Sakaguchi et al. does not expressly teach a mesh of the threaded block thread generated using helical coordinates. **Zicheng et al.** teaches helical coordinate system that can be applied to solve problems related to helical structures (Page 775, Para 1), as that would allow modeling the coordinate curves that coincide with the helix (Page 775, Para 5). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** the system of **Zicheng et al.** that included helical coordinate system

that could be applied to solve problems related to helical structures, as that would allow modeling the coordinate curves that coincide with the helix and a mesh of the threaded block thread generated using helical coordinates.

8.5 As per Claim 6, **Sakaguchi et al., Miller et al.** , **McCreery** and **Zicheng et al.** teach the system of Claim 2. **Sakaguchi et al.** also teaches that the mesh of the clearance hole block includes nodes positioned in radial, tangential and vertical directions for each portion of the clearance hole block using cylindrical coordinates and elements defined by interconnecting the node (CL1, L29-36; CL29, L10-18).

8.6 As per Claims 13-14, 16-18, these are rejected based on the same reasoning as Claims 1, 2, 4-6, supra. Claims 13-14, 16-18 are method claims reciting the same limitations as Claim 1, 2, 4-6, as taught throughout by **Sakaguchi et al., Miller et al.** , **McCreery** and **Zicheng et al.**

8.7 As per Claim 15, **Sakaguchi et al., Miller et al.** , **McCreery** and **Zicheng et al.** teach the method of Claim 14. **Sakaguchi et al.** also teaches specifying a parameter describing the clearance hole block; meshing the clearance hole block; and checking if the mesh model meets a predetermined criteria (CL1, L29-36).

Sakaguchi et al. does not expressly teach specifying a parameter describing the fastener, and threaded block; meshing the fastener; meshing the threaded block; and checking if the mesh model meets a predetermined criteria. **Miller et al.** teaches specifying a parameter describing the fastener, and threaded block; meshing the fastener; meshing the threaded block; and checking

if the mesh model meets a predetermined criteria (Fig.2A; CL6, L54-64; CL8, L48-56), as finite element models may be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances (CL8, L53-56). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Sakaguchi et al.** with the system of **Miller et al.** that included specifying a parameter describing the fastener, and threaded block; meshing the fastener; meshing the threaded block; and checking if the mesh model meets a predetermined criteria, as finite element models might be used to analyze the stress of the fastener in regard to boundary conditions and manufacturing tolerances.

Allowable Subject Matter

9. Claims 7-11 and 19-23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 27 and 31 would be allowable if the objections described in Paragraph 5 are overcome.

10. Claims 25, 26, 28, 29, 30 and 32 are allowed.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
July 10, 2004

HUGH JONES Ph.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100